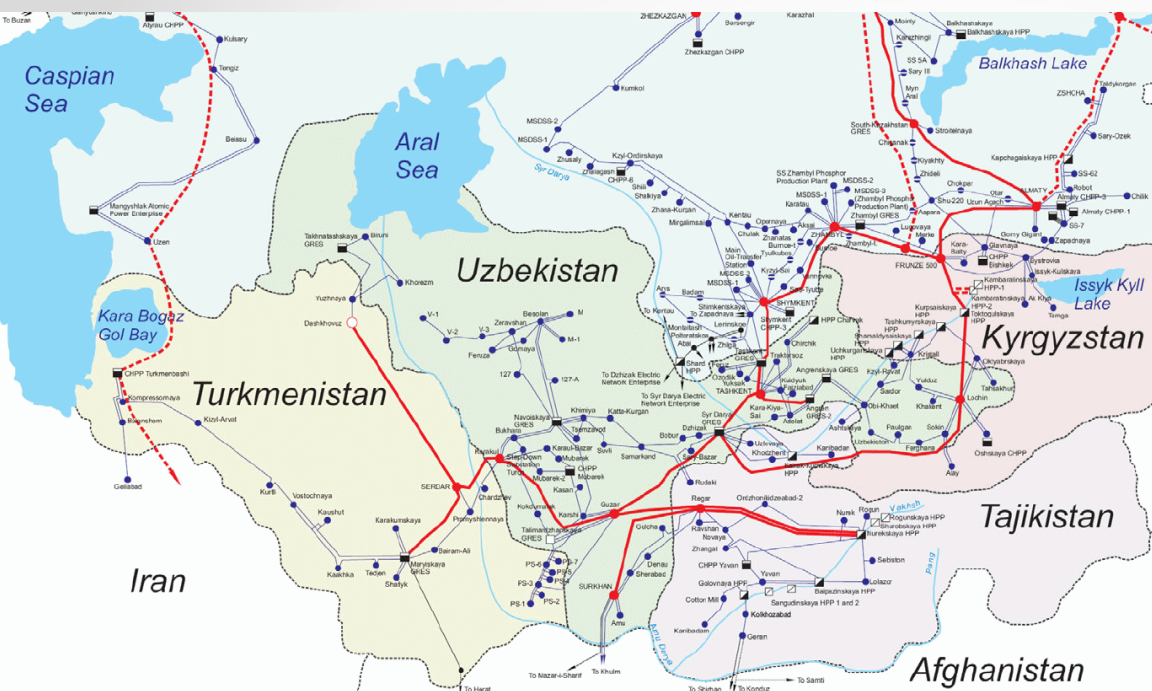


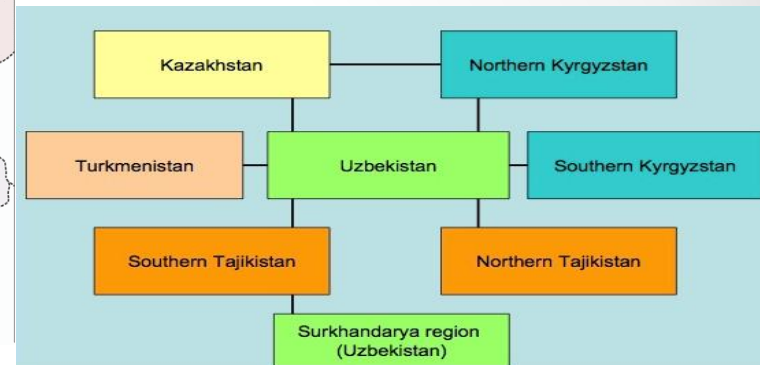
Large Hydro Power in Central Asia: Structural Disagreements

Farkhod Aminjonov
CAISS / University of Narxoz





Resource Sharing Mechanism

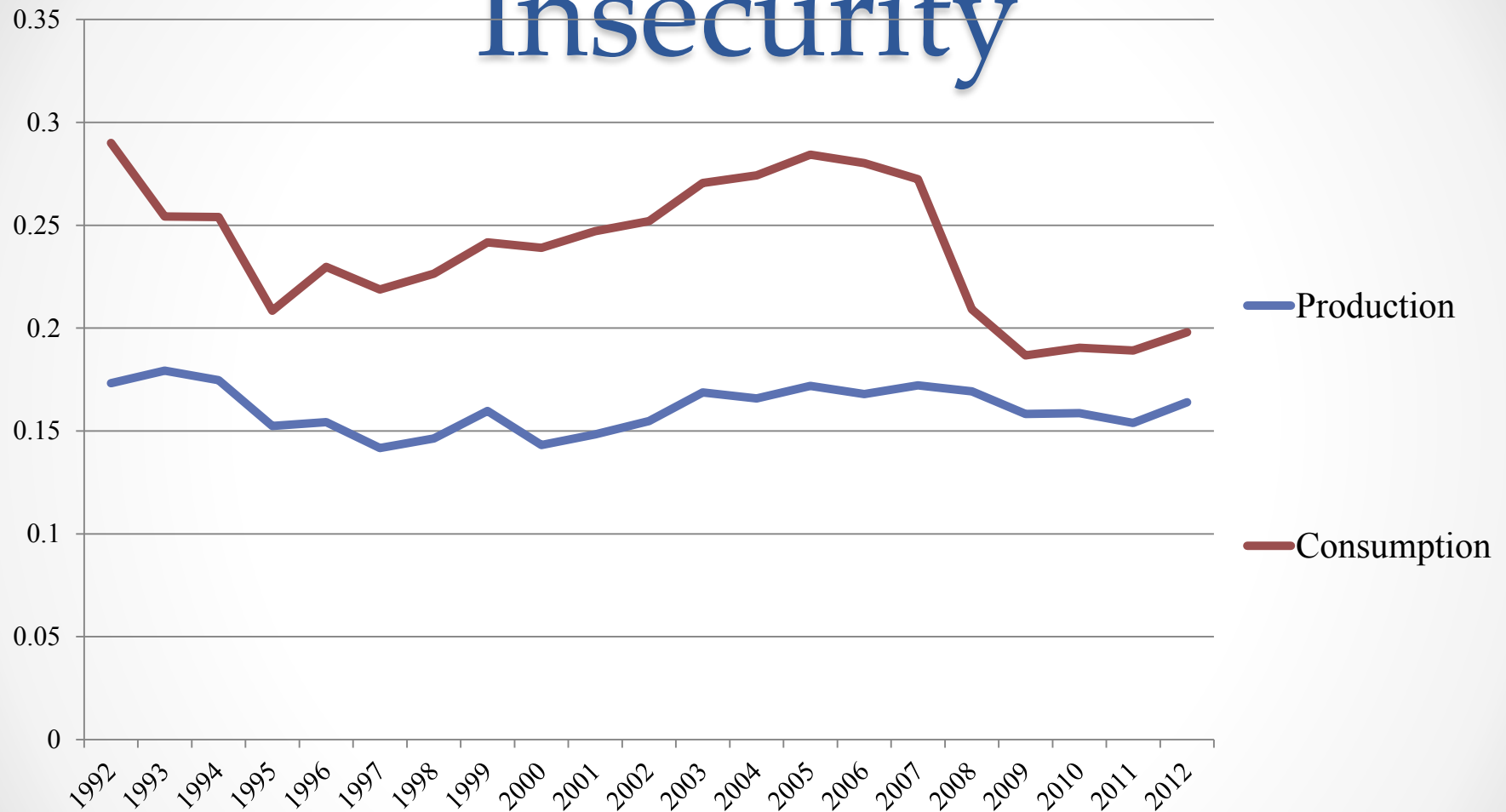




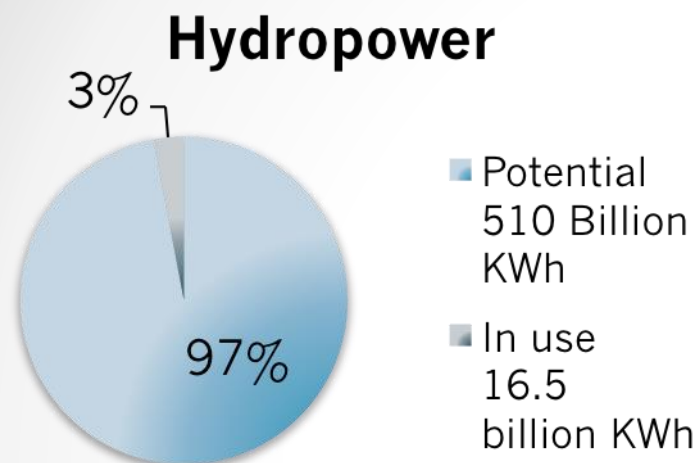
Large Hydro Power
Development is a MUST!

Energy Crisis in Upstream
Central Asia!

Tajikistan: Energy Insecurity



Large Hydropower is existential issue!



- Hydropower 98 %
- 97% Large and Medium HPPs
- 310 Small HPPs

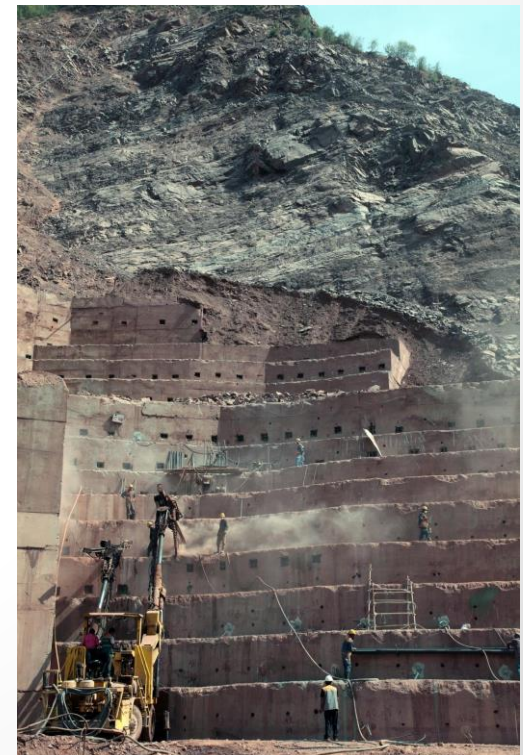


Name	Technical capacity, megawatt		
	Designed	Available	Operating
<u>Nurek</u> HPP	3,000	2,385	1,625.3
<u>Baipaza</u> HPP	600	450	273.5
Dushanbe thermal electric plant	198	100	4.9
<u>Yavan</u> thermal electric plant	120	—	—
<u>Kairakkum</u> HPP	126	104	83.8
The <u>Vakhsh</u> cascade of HPPs	285	211	139.61
The <u>Varzob</u> cascade of HPPs	25.36	8	7.1
Pamir Energy	42	39	37
MGES	13	11	10
<u>Sangtuda</u> HPP-1	670	670	440
<u>Sangtuda</u> HPP-2	110	110	40
Total	5,190	4,088	2,661.21

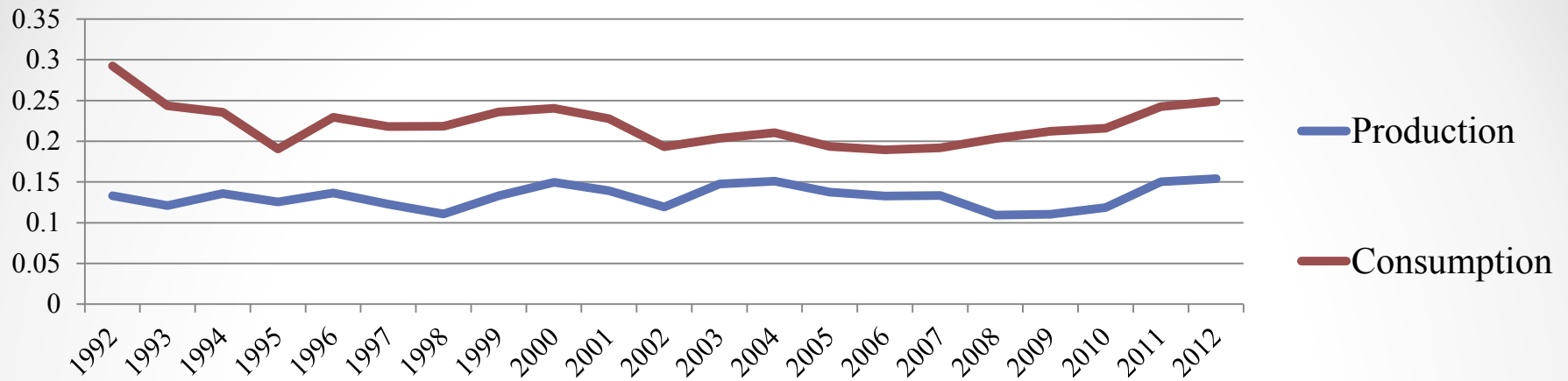
Rogun dam/HPP

Key Parameters	FSL1290	FSL1255	FSL 1220
Dam Height [m]	335	300	265
Reservoir active storage [hm ³]	10,300	6,450	3,930
Area at FSL [km ²]	170	114	68
Filling period [yr]	16	13	9
Minimal operating lifetime [yr]	115	75	45
Annual average cascade [TW]	34.4, 34.3, 34.1	32.5, 32.4, 32.2	30.2, 30.1, 29.8

- **Only Large-HPPs** can solve the energy crisis in Tajikistan
 - 2009–2020 → to build 189 more small HPPs to add additional 103.6 MW;
 - Rogun HPP – 3600MW
- **Isolated** from outside energy markets!
- **Climate Change** is affecting water availability → if Rogun is not built in the recent future, will be late...



Kyrgyzstan Mitigating Energy Crises



- Potential 142 billion kWh;
- Hydropower 60% in 1990 and 90% in 1998;
- Household consumption 63%.



Sources of Hydropower

Object	Number of aggregates	Installed capacity, MW	Average production capacity, million kWh	Investment needed, million US\$	Approximate construction time
Susamir–Kokomeren HPPs cascade					
Karakol HPP	2	33	104	257,84	2015-2017
Kokomeren – 1 HPP	4	360	904	1607,8	2014-2017
Kokomeren – 2 HPP	4	912	2412	1478,1	2014-2021
Upper Naryn HPPs cascade					
Akbulun HPP	2	100	372	137	2017-2019
Naryn–1 HPP	4	62	227	85	2014-2016
Naryn–2 HPP	2	60	235	82	2015-2017
Naryn–3 HPP	2	60	254	82	2017-2019
Middle Naryn HPP cascade					
Kambarata–1 HPP	4	1600	5164	2568	2015-2021
Kambarata–2 HPP	3	360	1148	188	2013-2019
Kara–Keché TPP					
Kara–Keché TPP	4	1400	9600	2183	2014-2022

Kambarata-1 and Upper Naryn HPP cascade???

Energy Security – Basic Human Need

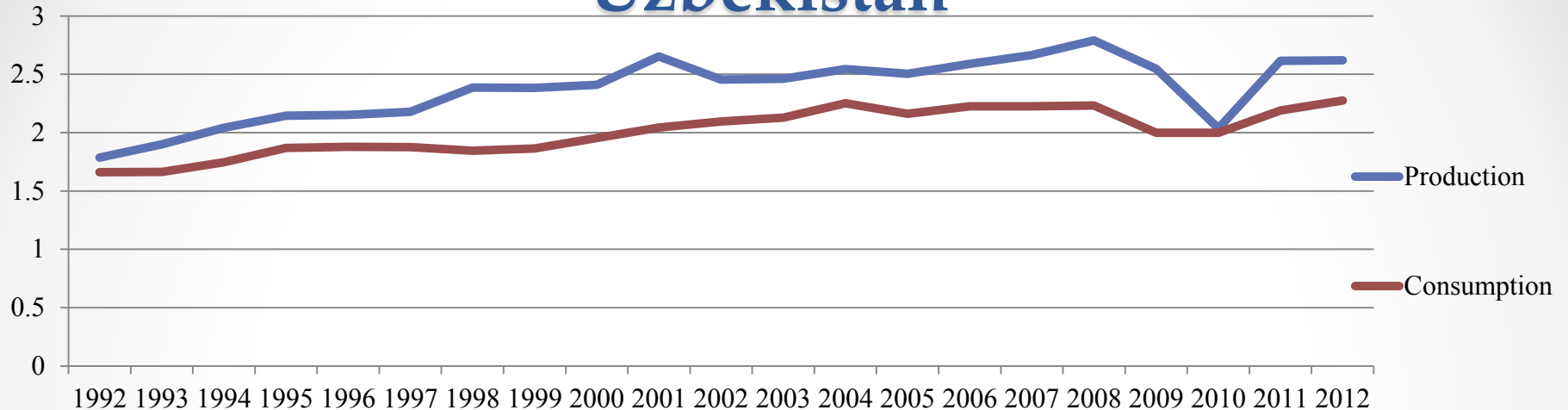
- Kyrgyzstan consumes
 - on average 22–23 million kWh of electricity during warm summer days
 - **70 million kWh** during cold winter days
- **Household** sector – 7.2 billion kWh, **constituting 63 percent of the overall electricity** production.
- Lack of ability to meet basic human needs.
- Syrdarya river stream decrease **10-30% already by 2030-2050...**



Uzbekistan will not back
down!

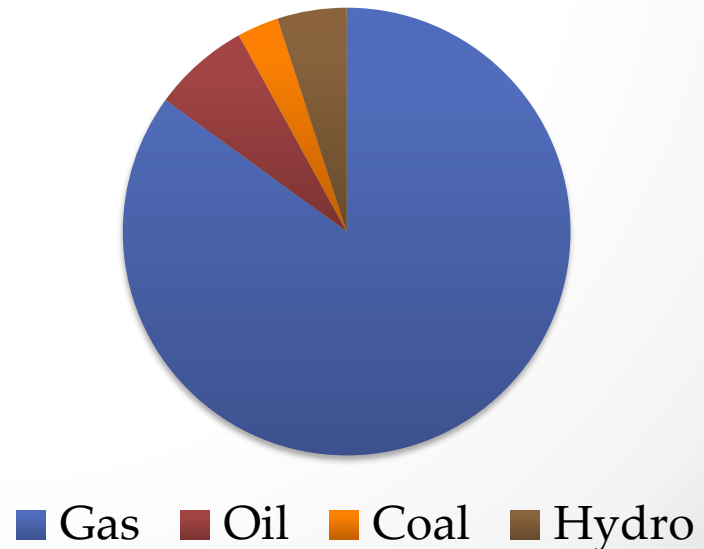
Energy leverage no longer
serves political purpose!

Independent, but Not Self-Sustaining Uzbekistan



- Potential:
 - Biomass 800 MW;
 - Solar – 593,000 MW;
 - Wind – 1,600 MW;
 - Small HPP – 1,800 MB
- Being used:
 - Biomass – 1.5 MW;
 - Solar 1 MW;
 - Wind – 1 MW;
 - Small HPP – 394 MW.

Energy Consumption Balance



Energy Insecurity

Age of Installed Generation Assets

	Up to 10 years	11 to 20 years	21 to 30 years	Over 30 years
Kazakhstan	11%	11%	33%	44%
Kyrgyzstan	4%	9%	23%	64%
Tajikistan	14%	0%	12%	74%
Uzbekistan	7%	5%	13%	75%



	Uzbekistan
Average subsidization rate (%)	58.7%
Subsidy (US\$/person)	406.1
Total subsidy as share of GDP	21.7

- Lost leverage!
- Not about cotton anymore
 - → 1.2 million hectares in 1913 → 4.2 million hectares in 1990 → 1.255 million hectares!
- 90% of water consumed by agriculture
 - → 30-35% of working population.
- Inefficient and outdated irrigation infrastructure (50-60%)



www.alamy.com - EJ0171



Hydropower in Afghanistan

– a threat to Central Asia?

	Project	River	Province	Capacity (MW)	Commencement date	Annual energy (GWh)	Estimated cost (m US\$)
1	Bghdara	Panshir	Kapisa/Parvan	210	2021	968	600
2	Surobi 2	Kabul	Lagman	180	2021	891	700
3	Kunar A (Shal)	Kunar	Kunar	789	2022	4772	2000
4	Kajaki Addition	Helmand	Helmand	100	2021	493	300
5	Kukcha	Kukcha	Badakhshan	445	2022	2238	1400
6	Gulbahar	Panshir	Panshir/Baghlan	120	2021	594	500
7	Capar	Panshir	Panshir	116	2021	574	450
8	Kama	Kunar	Nangarhar	45	2021	223	180
9	Kunar B (Sagal)	Kunar	Kunar	300	2021	1485	600
10	Kajaki Extention	Helmand	Helmand	18.5	2015	91	90
11	Olambagh	Helmand	Uruzgan	90	2021	444	400
12	Kilagal		Baghlan	60	2021	297	250
13	Upper Amu	Amu Daria		1000	2023	4955	2500
14	Dashtijum	Pyanj		4000	2023	19819	8000

- 5 out of 6 rivers in Afghanistan – transboundary!
- Water distribution agreement – 1977 Iran and Afghanistan.

World Bank Projects



Kyrgyz Republic



Tajikistan



Afghanistan



Pakistan



❖ Rogun → Economic, Environmental, Social and Technical Assessment

❖ Third Party Mediator? Ineffective!

❖ Self-financing failed!

❖ Numerous reports ADB, WB, etc. enforcement?

Intra-Central Asian water - energy cooperation

- **Full scale re-integration is problematic**
- Recommendations:
 - **Create a platform for** regional water-energy governance.
 - **Energy–Water nexus** – start solving water disputes through energy initiatives, not the other way around.
 - **Maintaining transportation infrastructure** – not building new facilities!
 - **Restore intra-Central Asian** electricity trade on short-term trading arrangement.
 - **Hydro-energy – Renewable energy/** Not alternative

Thank YOU!